A MAJOR
DEVELOPMENT
IN ELECTRONIC
INFORMATION
STORAGE AND
RETRIEVAL
RCA
3488

Model 3488 RANDOM ACCESS COMPUTER EQUIPMENT

lowest-cost random access
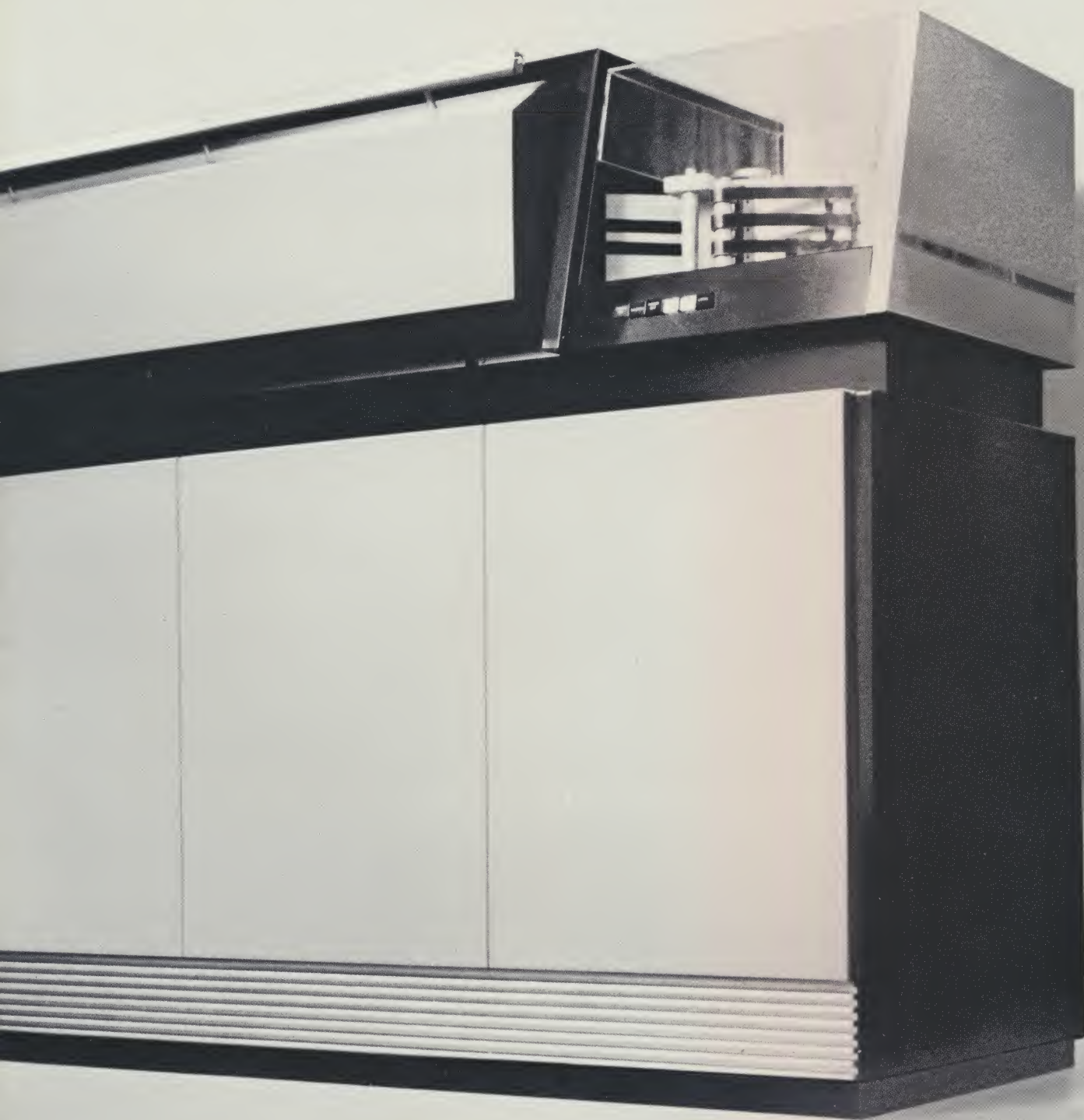
as little as 6.3¢ per month per 10,000 characters
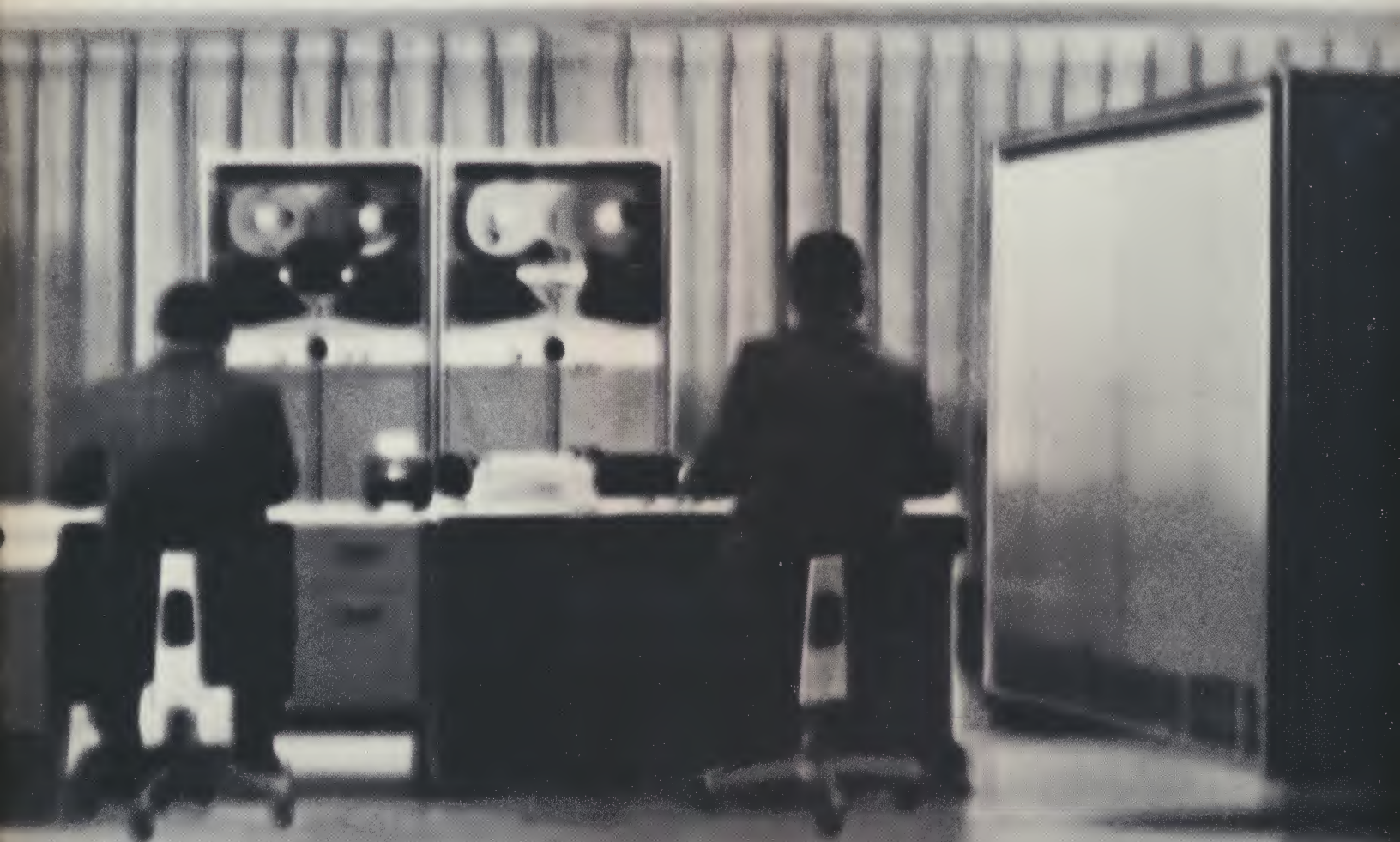
the first practical answer

for continuously current information processing of all your business facts and files

for tasks that previously were prohibitively expensive

massive on-line storage

up to 5.45 billion character

3488 ... MASS RANDOM MEMORY for the RCA 301/330? computers...a powerful new ally of management for time? ly control, instant service, and efficient daily operations

BASIC STORAGE ELEMENT is a flexible, magnetic-coated card, 16 x 4½ inches in size. A set of 256 cards, each with a discrete address, comprises a magazine. Much sturdier than magnetic tape, the magnetic storage cards are specially constructed for long-lived, repeated use. In effect, each card may be likened to the magnetic recording surface of a drum, flattened to a plane. Data are recorded in 64 bands, each comparable to a 2,600-character strip of magnetic tape. For random access capability, each band is made up of four addressable blocks.

During the 17-year evolution of electronic data processing, one economi? and mathematical fact has overshadowed every technological gain—*infor? mation has continued to explode at a faster rate than it could profitabl? be controlled for intelligent use.*

This is the long-standing management need first answered practically b? RCA 3488—a momentous achievement in low-cost mass information stor? age and retrieval. The 3488 is a complete system of hardware and soft? ware which gives unprecedented processing power with the RCA 301 an? 3301 Realcom computers.

The 3488 transforms corporate information into management energy. I? does so by breaking the cost and capacity barriers which in the past hav? limited random access systems to moderate-volume applications.

All of the user's central files—up to the most massive proportions—ca? now be totally on-line, instantly accessible to management. Any corporat? record or transaction is available in a fraction of a second and at a fractio? of the cost of other large-volume systems. Management reports, answer? to file inquiries, even normal daily batch processing, are all accelerate? powerfully by the 3488's facility in dealing with "live" facts.

Thus, the 3488 places a vital resource—information—at the full-time ser? vice of business managers for timely decision and dynamic control.

3488 IS THE FIRST multi-billion-character electronic computer storage system that qualifies on all counts for low-cost, fast, direct and convenient information access. It is based on thousands of flexible magnetic storage cards, grouped in removable magazines.

The 3488 system combines the economy of serial data processing with the ability to provide highly flexible on-line random access and real-time processing. Its features include: ■ Modular expansibility to accommodate growth. ■ Simplicity of operation for over-all efficiency. ■ Rugged reliability to make it a dependable computer adjunct. ■ Ease of use through comprehensive software.

Completely Modular Memory

The 3488 system can range from 340 million to 5.45 billion characters cap[
ity—with one computer. It begins with a standard unit: eight magazines . . .
million characters, a card selection and transport mechanism, a read/write
tion, and a multi-unit control module. The system can be built up, when an
needed, in three-ways:

1. By adding an eight-magazine auxiliary to each standard 3488 unit…for c
681 million characters.

2. By connecting up to three more eight- or 16-magazine 3488 units to each c
trol module.

3. By adding a second control module for a maximum of eight 3488 units—v
64 or 128 magazines—thereby also permitting simultaneous read and wr

Additionally, magazines may be re-arranged or interchanged in the same 3
unit, or among different units or installations.

Designed for Simplicity and Accuracy

Simplicity of operation is the key to the 3488's efficiency and accuracy at wo
Each card in the magazine is uniquely notched so that the precise one desi
may be accessed. All of the cards are "power selected" for positive, relia
control. The transport mechanism moves the selected card onto the racew
then to a rotating drum. Precise, "locked-in" data transfer is performed by
read/write station at the drum. Multiple read/write heads are widely spac
to eliminate cross-talk. They cover four bands with each head positioning. T
head assembly may be moved to any of 16 positions.

Electronic and photoelectric sensors along the raceway verify that the select
card is coming up, alert the control unit by the leading edge signal to get rea
for data transfer, and identify the blocks. When read and read-after-wr
parity checks indicate a valid data transfer, a gate to the raceway opens and t
card is returned to its magazine. An error condition will keep the gate clos
so that the card is taken on another circuit under the heads.

Access Time-Saving

Pre-selection reduces average access time by permitting addressing of another storage card within the same 3488 unit so that it is ready for transport and data transfer, as soon as the exit gate opens to release the card currently on the drum. It is also possible to overlap card selection on as many as six 3488 units, while two others are executing concurrent data transfers. Thereby, access time to a master record for a transaction may be reduced to a minimum—an average 30 milliseconds if the required card is on the drum.

Built-In Reliability Features

Retaining all the advantages of interchangeability which apply to magnetic tape, the 3488 virtually eliminates problems arising from repeated manual handling of tape reels. Magazines can be handily removed in protective trays for interchange or vault storage. Insertion of a new or replacement card in the magazine is mechanized. Cards are packaged in dust-tight envelopes with a ribbon for "hands off" insertion.

The 3488 unit, magnetic cards and control module are designed to work together for data security, beginning with the basic address verification, parity check on read, and parity check after write.

Comprehensive Software for Ease of Use

A comprehensive package of specially developed 3488 software, in addition
enhancement of existing RCA 301 and 3301 Realcom programming syste
for operation with the 3488, has been designed for: Ease of use | A minimum
user programming | Economy in reprogramming and conversion | Flexibil
and speed for a wide range of applications

Reduces Programming Effort

Actual physical addressing of data is performed for the user by 3488 softwa
which permits storage and handling of information in a logical manner. T
software automatically converts sets of logical addresses to physical address
Dynamic file maintenance—through control of insertions, deletions and reco
size changes—streamlines both random and sequential file processing.

A number of variable length records or tags may be grouped in fixed "da
buckets," the basic logical units of storage, one or more blocks in length. Ta
specify the bucket location of the record within the file. The most economi
bucket size may be specified to accommodate the size and quantity of t
records being entered. Bucket size is limited only by the amount of core mer
ory set aside for input/output.

Speeds Throughput

The concept of buckets comprising files, organized in memory rectangles a
controlled by software at all levels, takes advantage of the 3488's huge capac
to accelerate throughput. Data may be handled by records or tags from t
bucket to total file level. Standard software controls are used at the system, ma
azine, card and bucket levels—and may be supplemented by the user's own pr
grammed controls.

A major feature of the 3488 software system is that no more than two seeks a
necessary to retrieve an overflow record, as contrasted with extensive chainir
customarily found in random access processing.

Efficiency for Variety of Processing Techniques

There is a wealth of choices of data organization or processing techniques when you turn to the 3488 for controlled data storage and retrieval. It is efficient with all of the generally used methods. This versatility permits the user to retain existing system procedures, or to adapt or combine new procedures for stepped-up throughput.

Implemented by easy-to-use software, low-cost 3488 capacity makes physically and economically feasible grandfather-father-son file maintenance techniques. The transaction summaries and journals, normally required by an application, may readily be created concurrently with posting in a single pass through the computer. Thus, data are available should file reconstruction be needed.

Use 3488 for Sequential Processing one item after another ordered by primary number or key—facilitated by directories with "high-hit" summary information, and an efficient, special generalized sort system which ties into your own programming or may be used independently.

Use 3488 for Serial Processing by consecutively located records or buckets—to gain the ease of logical file operations with 3488 software. Data transfer can be continuous, with one instruction . . . useful for fast bulk processing . . . for storing programs, tables, matrix algebra arrays . . . for duplicating master files. Full data control is gained by maps of file locations and by indices or tables for individual file entries.

Use 3488 for Random and Real-Time Processing going directly to a specified file location for a desired record . . . for processing as transactions occur . . . as information is generated . . . without passing the entire master file. Information is current, time and cost savings are gained and customer service is improved on daily activities, such as inquiries, orders, changes, and payments.

Permits Operations Previously Not Practical

New management techniques, total information on across-the-board operation integrated data processing and communications, projections based on years cumulative activity history—these are some of the vistas opened by the 348

Scientific master plans may now be based on volumes of data which heretofo could not have been economically handled—integrating, for example, produ tion, inventory, scheduling, cost, market analysis and demographic data.

Instant facts for management and administration, and replies to customer i quiries need no longer be deemed a luxury when the 3488 is used for real-tim processing. A closed-loop of data acquisition, processing, and reply and actic provides management with event-oriented responsiveness, using local interrog tion and display or communication lines.

'One Pass' Processing can now be feasibly used to reduce multiple comput runs for complex operations with massive information files. With this techniqu interrogations or transactions pertaining to a specific item or account trigg updating of several associated files in one computer run.

Thus, in a large military supply management application, cost accounting ma be superimposed on control operations. Or, in an insurance application, a inquiry or transaction pertaining to a specific policyholder or coverage may b read into the computer once and posted to many files: the agent's productio record, premium status record, policy loan file, reserve and valuation file, an policy exhibit.

8 Benefits to Answer Management's Needs

Up to now, the computer user has had to reconcile his needs for timely working data with cost-per-bit of storage, system cost per unit of work, and future storage capacity requirements. The 3488 meets these needs very advantageously.

1. It offers lowest-cost random access on the market.

2. It provides the versatility of combined bulk and random processing to the extent and complexity best suited to the application.

3. It adapts economically to future growth through an easy-to-use modular expansibility.

4. It permits addition of file capacity as needed, via unique RCA software, merely by redefining the files.

5. It supplies the infinite storage and back-up capacity characteristic of magnetic tapes by full interchangeability of magazines.

6. It features simple basic mechanical design for positive card selection and controlled data transfer, and numerous accuracy checks and controls for reliable performance.

7. It reduces the load on an existing tape system by supplying only those records actually required for the operations.

8. Finally, it extends advanced techniques and flexibility of EDP satellite operations to most present and prospective computer users—large and small.

Creates an entire new generation of applications in many fields

Insurance Companies—total consolidated functions including immediate claim settlement and inquiry processing (real-time with communications), billing, rating, claim accounting and statistics on policies in force.

Telephone Companies—assignment of trunk facilities.

Utilities (Gas and Electric)—on-line customer inquiry to current master file information, customer and cash accounting.

Government Civilian and Military Agencies—criminal and alien records, Federal cataloging, personnel accounting and management, labor and population statistics, logistics management, fiscal accounting and project control.

Transportation—freight car accounting, truck and plane dispatch, route scheduling, and rate look-up.

Manufacturing—on-line scheduling, remote data gathering, allocation of manpower and facilities.

State and Local Government—motorist and vehicle licensing, tax records and accounting, social security programs accounting.

Automotive—scheduling, product mix, manpower and equipment loading.

Retail—on-line accounts receivable, inventory control, sales statistics.

Wholesale—on-line inventory control.

Scientific—automatic machine translation, hierarchical indexing, sample frameworks, multi-stage random and purposive sampling, heat transfer tables.

RCA 3488

PERFORMANCE SUMMARY
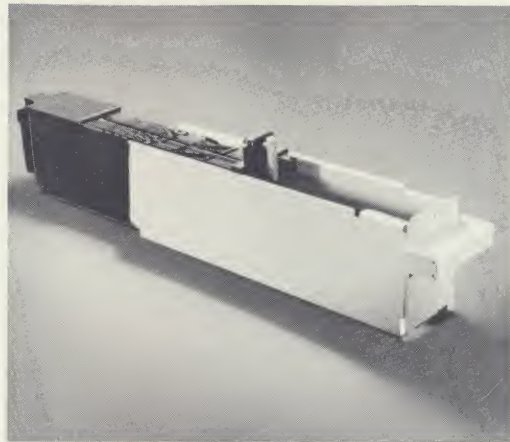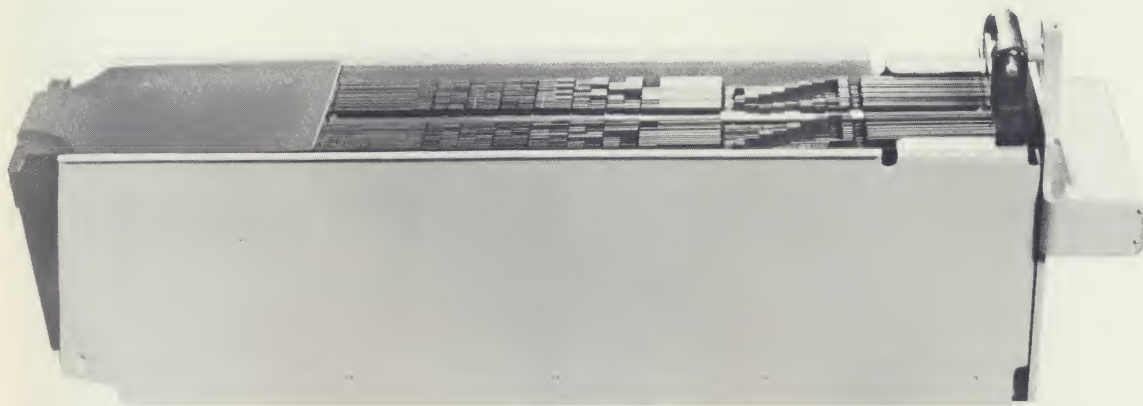
CAPACITY

650 characters per block

4 blocks per band

64 bands per magnetic card

166,400 characters per card

256 magnetic cards per magazine

42,598,400 characters per magazine

8 magazines per 3488-1 unit

340,787,200 characters per
8-magazine unit

681,574,400 characters maximum per
16-magazine 3488-2 unit

One to four 3488 units per control

Two controls maximum per system

5,452,595,200 characters maximum
per system

OPERATIONS

700 bits per inch recording density

80,000 characters per second data
transfer rate

290 milliseconds average card access
time from first magazine
...30 milliseconds average access time
per record if card is on the drum

60 milliseconds per revolution
drum speed

8 milliseconds transfer time one block
(650 characters)

35 milliseconds transfer time one
band (four blocks)

3.84 seconds—transfer entire card
—166,400 characters

FEATURES

Selects any desired block with
one instruction

Reads or writes 1-256 blocks
with one instruction

Selection of magnetic card
independent of computer control
once initiated

Simultaneous selection of magnetic
cards with multiple read/write stations

Addressing and data transfer
operations may be overlapped with
compute and input/output functions

Read-after-write parity check

Automatic correction of single bit
drop-outs on read

Built-in verification of selected
magazine and card

One of the eight or 16 magazines comprising an RCA 3488 unit is shown with its set of 256 magnetic storage cards, accommodating over 42 million characters. Removable magazines, safely and readily handled in protective trays, provide infinite vault storage capacity, and may be interchanged in the same 3488 unit or among multiple 3488 installations. The pattern created by the notches of the set of cards indicates the discrete addressing for powered extraction of individual cards.